XIII INTERNATIONAL CONGRESS OF PREHISTORIC AND PROTOHISTORIC SCIENCES - FORLÌ - ITALIA - 8/14 SEPTEMBER 1996

PROCEEDINGS

6 WORKSHOPS - TOME II

- LITHIC TECHNOLOGY: FROM RAW MATERIAL PROCUREMENT TO TOOL PRODUCTION
- CA' BELVEDERE DI MONTE POGGIOLO: THE FIRST INHABITANTS IN EMILIA-ROMAGNA
- BEFORE FOOD PRODUCTION IN NORTH AFRICA: GENERAL QUESTIONS AND ANALYTICAL TOOLS DEALING WITH RESOURCE EXPLOITATION AND POPULATION DYNAMICS AT 12,000-7000 BP
- FUNCTIONAL ANALYSIS OF LITHIC ARTEFACTS: CURRENT STATE OF THE RESEARCH
- RELATIONS BETWEEN THE CAUCASUS, ANATOLIA AND S.E. EUROPE IN THE COPPER AND BRONZE AGE
- THE TEACHING OF PREHISTORY IN SCHOOLS AND UNIVERSITIES
- FIRST SUGGESTIONS FROM ALTAMURA CAVE
- THE ARCHEO-PALAEONTOLOGICAL SITES OF THE SIERRA DE ATAPUERCA (SPAIN)
- INITIATIVES FOR A MODERN MUSEOGRAPHY

Edited by: Alberto Antoniazzi, Aldo Antoniazzi, Juan Luis Arsuaga Ferreres, José Maria Bermúdez de Castro, Eudald Carbonell i Roura, Elena Cavallini, Savino di Lernia, Federica Fontana, Carmen Gutierrez Saez, Laura Longo, Giorgio Manzi, Sarah Milliken, Luiz Oosterbeek, Viera Pavukova, Marco Peresani, Vittorio Pesce Delfino, K. Pizchelauri, Luciana Prati, Robert Sala i Ramos, Carlo Peretto

ABACO

Scientific direction: Carlo Peretto
Editorial direction: Carlo Giunchi

Editing coordination: Marinella Fabro, Andrea Laghi
Layout: Marinella Fabro, Andrea Laghi
Photocomposition: Flavio Ronchi for UNA CITTA' s.c.r.l., Forlì
Print: Grafiche M.D.M. Litografia s.r.l., Forlì
Publisher: A.B.A.C.O. s.r.l., Forlì

VOLUME 6 - Tome II

This volume has been realised with the contribution of:
CNR - Comitato 15, Scienza e Tecnologia Beni Culturali.

ISBN 88-86712-48-0

UNIONE INTERNAZIONALE DELLE SCIENZE PREISTORICHE E PROTOSTORICHE
Membro del Consiglio Internazionale della Filosofia e delle Scienze Umane
(C.I.P.S.H. - U.N.E.S.C.O.)

UNION INTERNATIONALE DES SCIENCES PRÉHISTORIQUES ET PROTOHISTORIQUES
Membre du Conseil International de la Philosophie et des Sciences Humaines
(C.I.P.S.H. - U.N.E.S.C.O.)

INTERNATIONAL UNION OF PREHISTORIC AND PROTOHISTORIC SCIENCES
Member of the International Council for Philosophy and Humanistic Studies
(C.I.P.S.H. - U.N.E.S.C.O.)

ATTI DEL XIII CONGRESSO

ACTES DU XIII CONGRES

PROCEEDINGS OF THE XIII CONGRESS

VOLUME 6 - Tome II

FORLI' - ITALIA
1996
8 - 14 settembre
8 - 14 septembre
8 - 14 september

A.B.A.C.O. EDIZIONI

WORKSHOP 13

Ca' Belvedere di Monte Poggiolo: i primi abitanti in Emilia-Romagna
Ca' Belvedere di Monte Poggiolo: les prèmiers habitants en Emilia-Romagna
Ca' Belvedere di Monte Poggiolo: the first inhabitants in Emilia-Romagna

Coordinatori / Coordinateurs / Coordinators:
Alberto ANTONIAZZI, Aldo ANTONIAZZI, Elena CAVALLINI, Federica FONTANA, Sarah MILLIKEN, Carlo PERETTO

THE STRATIGRAPHIC SEQUENCE OF THE SANDY GRAVEL DEPOSIT AT THE PALAEOLITHIC SITE OF CA' BELVEDERE DI MONTE POGGIOLO

*Aldo Antoniazzi *, Carlo Peretto ***

** Via Tumedei 90, 47100 Forlì, Italy.*
*** Dipartimento di Scienze Geologiche e Paleontologiche, Università di Ferrara, corso Ercole I d'Este 32, 44100 Ferrara, Italy.*

1. INTRODUCTION

The stratigraphic excavation of the gravely sediments at Ca' Belvedere containing a Palaeolithic flake and core industry in primary context revealed the following: the original sandy gravel deposit in the area near the house (maximum thickness explored circa 4.3 m); and the base of the uneroded original palaeosoil (Palexeralf) which conserved the lithic industry as a residue of the digestion of the pedogenised bedrock and the relative lithological substrate in the area situated towards the valley (maximum depth explored circa 3 m).

The excavated levels (figure 1) lie next to and are covered in unconformity by the local Argille Azzurre as a result of a past slip (Antoniazzi and Piani, 1992; Antoniazzi *et al.*, 1996). The juxtaposition of the palaeosoil to the original sediment is also probably related to the same phenomenon which occurred during the Würm (Cattani, in Antoniazzi *et al.*, 1986; Cattani, 1992).

2. ORIGINAL SEDIMENT WITH THE LITHIC INDUSTRY

In the area where the original sediment was found (figure 1) in the section one can see:

1. a slip surface which uphill separates the Argille Azzurre from the deposit containing the lithic industry;
2. a stratified deposit, moderately deformed over time by tectonic and gravitational activity, with a light slope towards the west, which is accentuated into a "flute mouthpiece" towards the slip margin and decreases in the lower part of the excavation;
3. a first part of the deposit (levels 101 and 102), from the top downwards, which are mainly silty sands with gravel, very enriched with carbonates of illuvial origin, the residual trace of an overlying palaeosoil which has now been destroyed;
4. a second part of the deposit (levels 103-107) below the first part, in which gravel prevails in the sediment;
5. a third part of the deposit (108-118) below the second part, predominantly sandy;
6. the fourth, and deepest, part of the deposit (levels 119-122) which is still predominantly sandy, but disturbed by the mechanical slip and by the past flow of subterranean water, concentrated mainly along the unconformities and in the base deposits;
7. the presence of a complex stratigraphy with lenticular or elongated orientation, not always clear during the excavation; therefore the excavation levels, which were for practical reasons about 10 cm thick, were often artificial although we generally managed to follow the

orientation of the sediment.

The following description and interpretation of the stratigraphic sequence has been carried out taking into account the data already published on the upper part of the excavation (Antoniazzi *et al.*, 1992), the field notebook, the observations made during the last phases of the excavation and what can be observed in the section.

Above	Agricultural soil Ap removed
101a	Discontinuity produced by agricultural activity. Artificial level of about 10 cm thickness. The deposit slopes slightly towards the west. Whitish colour. Fine silty sand with lower amounts of gravel. Pebbles mainly flattened and without a preferential orientation (the sediment has probably been disturbed by agricultural activities). Various fresh lithic artifacts. Strongly enriched with carbonates of pedogenetic origin in the form of pulverulent and nodular concretions. Deposit cut towards the west by agricultural activities, interrupted towards the east by the discontinuity with respect to the Argille Azzurre and curved upwards in the form of a "flute mouthpiece".
101b	Artificial level circa 10 cm thick. Deposit slightly inclined towards the west with the same general orientation of the flattened pebbles. White colour (2.5Y8/2). Fine silty sand with gravel. Presence of fine small gravel and occasional flattened pebbles of large dimensions. Various lithic artifacts with fresh edges. High content of pulverulent and nodular concretions of carbonates of pedogenetic origin. Deposit cut towards the west by agricultural activities, to the east curved in the form of a "flute mouthpiece" in contact with the Argille Azzurre.
101c	Artificial level with a thickness ranging between a few centimetres and zero (square 58). The deposit slopes slightly towards the west with the same general orientation of the flattened pebbles. White colour (2.5Y8/2). Fine silty sand with gravel. Various lithic artifacts with fresh edges. High concentration of pulverulent and nodular concretions of carbonates of pedogenetic origin. Deposit cut towards the west by agricultural activities, and towards the east curved upwards in the form of a "flute mouthpiece". *[Interpretation: Deposit 101 is strongly carbonated (Cca horizon of the palaeosoil decapitated by erosion) and shows signs of parallel plane sandy gravely sedimentation. Centrebar or bar summit disturbed by pedogenesis?]*
102a	Lithological discontinuity due to the reduction of the gravels and the increase of sand and silt. Artificial level 10 cm thick. Deposit slightly inclined towards the west. White colour (10YR8/2) or very light brown (10YR8/4). Fine silty sand with scarce fine gravel. The flattened pebbles, highly concreted, slope down towards the valley, and consequently it was easy to follow the orientation of the sediment during the excavation. Presence of some very altered pebbles (pedorelicts which entered the deposit in the original sedimentation phase) and tubular concretions of Fe and Mn. Lithic artifacts with fresh edges more frequent than in the previous levels. Abundant pulverulent and nodular concretions of carbonates of pedogenetic origin. The deposit is interrupted towards the east by an upwards curve in the form of a "flute mouthpiece".
102b	Artificial level 10 cm thick, which in square 77 tends to become very thin towards the east and south. Deposit slightly sloping towards the west. White colour (10YR8/2) or very light brown (10YR8/4). Fine silty sand with scarce fine gravel. The pebbles, which are very concreted, tend to have the same inclination as the sediment. Presence of some pedorelicts and tubular concretions of Fe and Mn. Presence of lithic artifacts with fresh edges as in the previous level. Abundant pulverulent and nodular concretions of carbonates of pedogenetic origin. To the west upwards curve in the form of a "flute mouthpiece".
102c	Artificial level of variable thickness (from 2 cm in square 76 to circa 20 cm in square 66) imposed by the orientation of the surface of the level below (103). Deposit slightly inclined towards the west. White colour (10YR8/2) or very light brown (10YR8/4). Fine silty sand, richer in gravel than the previous level (102b). Presence of lithic artifacts with fresh edges, as in the previous level. Presence of fragments of *Ostrea* sp. Abundant pulverulent concretions of carbonates of pedogenetic origin. To the east there is an upwards curve in the form of a "flute mouthpiece". *[Interpretation: Deposit 103 strongly carbonated (Cca horizon of the palaeosoil decapitated by erosion), fewer discontinuities and absence of structures (centrebar situation). In the lower part the distribution and dimensions of the gravel seem to show a reduction of the transport energy towards the top, and therefore the presence of a sector of cycle, with the base (gravely pavement) distinct from the artificial level. The characteristics suggest a bar deposit disturbed by pedogenesis]*

103a	Lithological discontinuity due to a pronounced increase in the gravely fraction in the sediment and marked by an irregular orientation of the top of the level, in which there are sparse pebbles without any specific orientation. Level about 10 cm thick, slightly inclined towards the west, with the same slope as the sediment, constituted by sandy gravel with silt with a lenticular orientation which, in the part deformed by the "flute mouthpiece", is characterised by granulometric variations and a concentration of pebbles. Very light brown colour (10YR8/4). Pebbles generally flattened, of variable dimensions between 1 and 20 cm, embricated in some tracts. The fine gravel is distributed in spots. At the base there is a concentration of pebbles of larger dimensions forming a NNE-SW alignment. The level disappears into lenses. Abundant presence of lithic artifacts with fresh edges. Frequent concretions of carbonates in nodules and as encrustations on pebbles. *[Interpretation: The deposit corresponds with a sequence truncated by the erosion of the lower part of a cycle, from the gravel pavement upwards. It seems to suggest a situation of bar front.]*
103b	Lithological discontinuity due to an increase in sand in the sediment. Artificial level 10 cm thick, slightly inclined towards the west with the same slope as the deposit. Light yellow colour (2.5Y7/4). Gravel more sandy than in the previous level (103a) with the presence of silt. Pebbles frequently flattened, of variable dimensions between 1 and 20 cm, normally not in contact and with a uniform distribution. Lenticular orientation of the level less marked than in the previous level (103a). Concretions of nodular carbonates or encrustations on the pebbles. Various lithic artifacts with fresh edges. To the east the "flute mouthpiece" is still present.
103c	Artificial level about 10 cm thick with the same slight slope towards the west of the sediment. Olive yellow colour (2.5YR6/6) with whitish patches due to the presence of carbonates. Sandy gravel with silt. With respect to level 103a there is an increase in the percentage of small gravel and a reduction in the dimensions of the largest pebbles (smaller than 12 cm), which are normally flat, not in contact and with quite uniform distributions. Lenticular orientation of the level little marked. Various lithic artifacts with fresh edges. Nodules of encrustations of carbonate concretions on pebbles. To the east the upwards curve in the form of a "flute mouthpiece". *[Interpretation: The scarce and poorly defined structures of the deposit may reflect a centrebar position, probably with traces of at least one renewal in the sedimentation. The artificial level separates the basal gravely pavement from the overlying sector of the cycle.]*
104a	Discontinuity marked by the arrangement of the flattened pebbles which show more or less the same slight slope towards the west of the deposit. Artificial level circa 10 cm thick. Olive yellow colour (2.5Y6/6). Sandy gravel with pebbles up to 10 cm in size, mainly flat, and with a particular concentration of medium sized ones (4-5 cm). Some nodules of carbonates. Lower frequency of lithic artifacts with fresh edges compared with the previous levels. Presence of malacofauna. To the east the deposit is curved upwards in the form of a "flute mouthpiece".
104b	Artificial level 5-6 cm thick which follows the slight slope of the level towards the west. Olive yellow colour (2.5Y6/6). Sandy gravel with flat pebbles (maximum 10 cm in size). Medium sized ones (4-5 cm) are still particularly frequent. Few nodules of carbonates. Lithic artifacts as in the previous levels. "Flute mouthpiece" curve in contact with the Argille Azzurre. *[Probable centrebar deposit.]*
105a	Discontinuity marked by the lenticular orientation of the deposit with depressions in the surface. Artificial level circa 10 cm thick. The sediment has the same slight inclination towards the west. Olive yellow colour (2.5Y6/6). Sandy gravel. The largest pebbles are found in the uphill squares. Some nodules of carbonates. Numerous lithic artifacts with fresh edges. Presence of malacofauna. The deposit is interrupted towards the east in the form of a "flute mouthpiece".
105b	Artificial level about 10 cm thick with the same slight inclination towards the west. Olive yellow colour (2.5Y6/6). Sandy gravel with lenticular orientation and concentrations of larger sized pebbles (10-12 cm) in certain areas. Carbonatic concretions, some of them large. Various lithic artifacts. To the east an upwards curve in the form of a "flute mouthpiece".
105c	Artificial level 5-6 cm thick which disappears towards the west. Olive yellow colour (2.5Y6/6). Sandy gravel with lenticular orientation of the deposit. Large carbonatic concretions. Fewer lithic artifacts with fresh edges. To the east upwards curve in the form of a "flute mouthpiece". *[Interpretation: Probable centrebar situation with partial erosion and corresponding pebble pavement. At the base, distinguished by the artificial level, the pebbly pavement of a cycle.]*

106a	Discontinuity highlighted by a deposit with pebbles, arranged more or less with the same slight slope towards the west of the sediment. Artificial level about 10 cm thick. Olive yellow colour (2.5Y6/6). Sandy gravel. The pebbles are less flat than in the previous levels. Some large carbonatic concretions. Few lithic artifacts with fresh edges. Absence of small flakes. The deposit is interrupted towards the east by the "flute mouthpiece".
106b	Artificial level about 10 cm thick slightly inclined towards the west like the stratification. Olive yellow colour (2.5Y6/6). Sandy gravel. Flat pebbles as above (106a). Unweathered fragments of *Ostrea* sp. Few large sized concretions of carbonates. Some lithic artifacts with fresh edges. To the east the usual "flute mouthpiece".
106c	Artificial level 6-8 cm thick inclined towards the west like the stratification. Olive yellow colour (2.5Y6/6). Flat pebbles as above. Unweathered fragments of *Ostrea* sp. Some large carbonatic concretions. Some lithic artifacts with fresh edges. To the east the "flute mouthpiece". *[Interpretation: Probable centrebar situation. At the base, distinguished by the artificial level, the pebbly pavement of a cycle.]*
107a	Clear discontinuity easily visible in the section, marked by the presence of large flat pebbles (maximum dimensions 30 cm) and their orientation which is the same as that of the level, slightly inclined towards the west. This orientation is essentially the same for all the flattened pebbles in level 107. Artificial level about 10 cm thick. Olive yellow colour (2.5Y6/6). Sandy gravel with average dimensions of the pebbles between 8 and 10 cm. Unweathered fragments of *Ostrea* sp. Some carbonatic concretions. Frequent lithic artifacts with fresh edges. To the east the "flute mouthpiece".
107b	Artificial level about 10 cm thick slightly inclined towards the west like the stratification, with the largest pebbles (maximum dimensions 30 cm) distributed irregularly at the top of the level. Light yellow colour (2.5Y7/4). Sandy gravel. Average dimension of the pebbles as above. Unweathered fragments of *Ostrea* sp. Presence of carbonatic concretions. Frequent lithic artifacts with fresh edges. To the east the "flute mouthpiece". *[Interpretation: Probable cycle of truncated bar.]*
107c	Artificial level about 10 cm thick slightly inclined towards the west like the stratification. Light yellow colour (2.5Y7/4). Sandy gravel. The dimension of the pebbles is about 8-10 cm but, compared with the previous level (107b), there is an increase in the larger sized ones (greater than 30 cm). Some flint pebbles with impact scars probably of natural origin and clear evidence of weathering. Presence of a pebble with lithodome burrows. Abundant large sized carbonatic concretions. Unweathered fragments of shell including *Ostrea* sp. Frequent lithic artifacts with fresh edges. To the east the usual "flute mouthpiece".
107d	Artificial level about 10 cm thick which follows the slightly inclined stratification towards the west. Light yellow colour (2.5Y7/4). Sandy gravel. Among the pebbles, often between 8 and 10 cm large, there are also some of larger dimensions (30 cm). Some weathered flint pebbles with scars probably of natural origin. Large isolated concretions of carbonates and Fe-Mn. Frequent lithic artifacts with fresh edges. The deposit terminates to the east with the usual "flute mouthpiece".
107e	Artificial level 8-10 cm thick with orientation slightly inclined towards the west of the stratification. Light yellow colour (2.5Y7/4). Sandy gravel. The sediment has a moderate lenticular orientation, marked by an increase of the silty fraction in square 65. The characteristics of the pebbles are analogous to those described in the previous levels of the same stratum. Some weathered flint pebbles with traces of flake scars which are perhaps of natural origin. Nodules of carbonates and Fe-Mn. Frequent lithic artefacts with fresh edges. The "flute mouthpiece" marks the discontinuity to the east. *[Interpretation: Probably cycles of truncated bars in situations which were also subject to marine influences.]*

108a	Discontinuity represented by a significant change in the granulometry. The sediment changes from being prevalently gravely to markedly sandy. The transition between this level and the one above (107) is blurred. The artificial level about 10 cm thick follows the slight inclination towards the west of the sediment. Light olive brown colour (2.5Y5/2). Sand with gravel. Frequent pebbles of small dimensions (3-6 cm) as well as some larger ones. Their orientation, as generally in level 108, tends to be the same as that of the stratum. Presence of flattened gravely elements with surface patinas of Fe-Mn. Few lithic artifacts. To the east the usual "flute mouthpiece".
108b	Artificial level 10 cm thick slightly inclined towards the west like the stratification. Light olive brown colour (2.5Y5/2). Sand with gravel. Concentration in patches, sometimes lenticular, of the gravel elements. Small sized pebbles common (3-6 cm). The larger ones (20-30 cm) are mainly found in localised areas. Flat gravel elements with surface patina of Fe-Mn are still found. Frequent lithic artifacts with fresh edges. The deposit terminates to the east with a "flute mouthpiece".
108c	Artificial level 10 cm thick slightly inclined towards the west like the stratification. Light olive brown colour (2.5Y5/2). Sand with gravel. Among the frequent small sized pebbles (3-6 cm) there are also larger ones (20-30 cm) which are normally concentrated in particular areas. Flattened gravel elements with a Fe-Mn patina continue to be present. There is a slight grading in the sediment since the percentage of medium sized pebbles increases towards the bottom of the level. Frequent lithic artifacts with fresh edges. The deposit terminates to the east in a "flute mouthpiece".
108d	Artificial level of variable depth, 2-10 cm, slightly inclined towards the west like the others. Light olive brown colour (2.5Y5/2). Sand with gravel with analogous pebbles to the previous levels and lenticular dense areas with gravel. Frequent lithic artifacts with fresh edges. The deposit terminates to the east in a "flute mouthpiece". *[Interpretation: Probably cycles of truncated bars appertaining to a more proximal sector of the system of braided channels than that which formed the overlying deposits. At the base, distinguished by the artificial level, there is the pebble pavement of a cycle.]*
109a	Very irregular and varied discontinuity surface. In some sectors it is marked by large embricated pebbles associated with concentrations of gravel. Artificial level of about 10 cm slightly inclined towards the west as is the sediment and the pebbles. This situation is common to the whole of sector 109. Light olive brown colour (2.5Y5/2). Gravely sand. The pebbles are sparse in the sandy matrix, though one also notes localised lenticular concentrations of gravel of small and medium sized dimensions. Carbonatic concretions. Lithic artifacts with fresh edges less frequent than in the levels above. The deposit is interrupted towards the east in a "flute mouthpiece".
109b	Artificial level about 10 cm thick, slightly inclined towards the west as is the stratification. Light olive brown colour (2.5Y5/2). Sand with gravel. Situation and deposition of the pebbles analogous to that described previously (109a). Some carbonate nodules. Frequent lithic artifacts with fresh edges. The deposit terminates towards the east in a "flute mouthpiece".
109c	Artificial level 10 cm thick slightly inclined towards the west as is the stratification. Light olive brown colour (2.5Y5/2). The pebbles are sparse in the sandy matrix, but there are still localised concentrations of elements of small and medium sized dimensions. Abundant lithic artifacts with fresh edges. The quantity of pebbles increases from the bottom upwards. Presence of nodular carbonatic concretions and lithic artifacts. The deposit terminates in a "flute mouthpiece". *[Interpretation: Probably a truncated bar cycle and centrebar deposits, situation of proximal braided channels system as previously].*
110a	Subdivision due to a greater presence of gravel in the sediment. Level about 14 cm thick slightly inclined towards the west as is the sediment and as are most of the pebbles contained in it. Light olive brown colour (2.5Y5/2). Gravel and sand with pebbles sparse in the sandy matrix. The deposit shows a reduction in the granulometry from the bottom upwards, highlighted by the localisation of medium and large sized pebbles at the bottom of the level. Presence of carbonatic concretions. Abundant lithic artifacts with fresh edges. The deposit is interrupted towards the east in a "flute mouthpiece". *[Interpretation: Truncated bar cycle in a proximal sector of the braided channels system, as in the previous case].*

111a	Return to a prevalence of sand in the deposit. Artificial level 10 cm thick, which follows the stratification which is slightly inclined towards the west as are the largest sized clasts present in it. Light olive brown colour (2.5Y5/2). Sand with medium fine gravel. Presence of carbonatic concretions. Abundant lithic artifacts with fresh edges. In the section, in square 76, there is the upper part of an oval agglomerate of pebbles in a clayey matrix which develops diagonally towards the bottom until it reaches in level 115 the clayey sediment beyond the discontinuity surface due to erosion (see figure 5). In this structure one sometimes finds centimetric lenses of brown soil (2.5YR4/4). The deposit is interrupted towards the east in a "flute mouthpiece".
111b	Artificial level about 10 cm thick, slightly inclined towards the west with characteristics generally analogous to those in level 111a. Abundant lithic artifacts with fresh edges. The deposit is interrupted towards the east in a "flute mouthpiece".
111c	Artificial level about 10 cm thick like the others slightly inclined towards the west according to the stratification and the average orientation of the pebbles. Light olive brown colour (2.5Y5/2). Sand with medium fine gravel and few decimetric pebbles. A certain lenticular orientation is highlighted by a concentration of silt in the southern part of the excavation. Carbonatic concretions are sparse. Various lithic artifacts. The deposit is interrupted towards the east in a "flute mouthpiece".
111d	Artificial level circa 8-10 cm thick slightly inclined towards the west as is the stratification. Light olive brown colour (2.5Y5/2). Sand with medium fine gravely elements with an average orientation according to the stratification. Presence of carbonatic concretions. Various lithic artifacts. The deposit is interrupted towards the east in a "flute mouthpiece". *[Interpretation: Deposit with little marked characteristics, probably related to centrebar situations in a proximal sector of the braided channels system similar to that in the previous cases. The anomalous tubular structure evident in the deposit is certainly postdepositional and subsequent to the landslide. It was probably produced by a preferential canalisation of the subterranean waters, originally formed in fissures, more or less localised, which formed in the sediment during the landslide. Some residual traces of an abandoned channel facies should be considered with caution given the presence of the perturbation mentioned at the site.]*
112a	Gradual transition to the previous level with an increase in the sandy fraction. Artificial level about 10 cm thick slightly inclined towards the west as is the stratification and most of the pebbles. Light yellowish brown colour (10YR6/4). The sediment is constituted by coarse and medium sand with abundant small gravel and some medium fine pebbles. Pebbles, the majority of them flattened, with Fe-Mn patina. Unweathered fragments of *Ostrea* sp. Few lithic artifacts. The discontinuity towards the Argille Azzurre starts to thin and the "flute mouthpiece" orientation almost disappears.
112b	Artificial level about 10 cm thick (10YR6/4). The mass is constituted by sand with small gravel and pebbles, often flattened, with Fe-Mn patina. Concentrations of silt with a lenticular orientation. Presence of sectors rich in silt and clayey lumps. Few lithic artifacts with fresh edges. "Flute mouthpiece" almost absent. *[Interpretation: Deposit with unmarked characteristics, probably related to centrebar situations in a proximal sector of the braided channels system similar to that in the previous cases.]*
113	Level distinguished by its lithology and the more marked lenticular orientation of the deposit. Artificial level about 10 cm thick inclined towards the west as is the stratification. Yellowish brown colour (10YR6/6). Sand with small pebbles and rare pebbles. In some parts lenticular concentrations or thin crusts of carbonated silt. Gravels with Fe-Mn patina. Some lithic artifacts. "Flute mouthpiece" almost absent. *[Interpretation: Probable bar front situation in a proximal sector of the braided channels system as in the previous cases. The concentrations of carbonated silt may depend on the subterranean circulation of water subsequent to the landslide.]*
114	Distinction based on the fact that there is an increase in the quantity of sand compared with the previous level (113) and small and slightly coarser gravel. Artificial level 6-8 cm thick slightly inclined towards the west as is the stratification. Yellowish brown colour (10YR6/6). In the upper part of the deposit with gravel elements there are also tracts of concentrations of silt. Presence of gravel with Fe-Mn patina. Lithic artifacts virtually absent. "Flute mouthpiece" almost absent.
115	Artificial level about 10 cm thick slightly inclined towards the west as is the stratification. Yellowish brown colour (10YR6/6). Gravely sand with zones of greater concentration of small gravel. Localised concentrations of silt. Presence of Fe-Mn patina on the gravel. Some lithic artifacts with fresh edges. Towards the discontinuity with the Argille Azzurre the "flute mouthpiece" is almost absent. *[Interpretation: Probable bar situation in a proximal sector of the braided channel system as in the previous cases.]*

116	Level about 10 cm thick slightly inclined towards the west as is the stratification. Yellowish brown colour (10YR6/6). Lenticular deposit of sandy and sandy silty levels with stones. Presence of Fe-Mn patina on the gravel. Some lithic artifacts with fresh edges. Towards the discontinuity with the Argille Azzurre the "flute mouthpiece" is virtually absent. *[Interpretation. Probable facies of bar summit or channel bottom.]*
117	Deposit constituted by lenticular plano-convex portions (with a diameter of 10-20 cm) of embricated layers of sand or silty sand with abundant stones. Level of about 8 cm slightly inclined towards the west as is the deposit as a whole and the pebbles contained in it. Presence of Fe-Mn patina in the gravel. Yellowish brown colour (10YR6/6). At the base of the deposit there is a discontinuous silty level. Absence of lithic artifacts. Towards the discontinuity with the Argille Azzurre the "flute mouthpiece" is virtually absent. *[Interpretation. Probable facies of bar summit or channel bottom.]*
118	Lenticular deposit more marked in its upper part. Level about 15 cm thick slightly inclined towards the west as is the sediment itself. Yellowish brown colour (10YR6/6). In the upper part there is a high presence of discontinuous lenses of sandy and silty sand rich in stones. In the rest of the deposit sand predominates. Fe-Mn patina on the gravel. Lithic artifacts virtually absent. "Flute mouthpiece" virtually absent. *[Interpretation. Probably an abandoned channel facies.]*
119	Distinguished from the previous level by the increase in the presence of pebbles and compact clayey silt. Level about 10 cm thick slightly inclined towards the west according to the general orientation of the stratification. Yellowish brown colour (10YR6/6). In particular sectors one finds concentrations of non-oriented pebbles (zones of underground water flow in areas disturbed during the mass movement). In the rest of the deposit there is a predominance of sand. Presence of Fe-Mn patina on the gravel. Absence of lithic artifacts. "Flute mouthpiece" virtually absent.
120	Characterised by the presence of weakly defined lenticular orientation and chaotic concentrations of pebbles. Level of about 10 cm thickness without evidence of preferential planes. Yellowish brown colour (10YR6/6). Gravely sandy deposit with pebbles and sand arranged in vague lenses. Presence of Fe-Mn patina on the gravel. The chaotic concentrations of pebbles are probably due to the disturbance of the base gravel sediment caused by the slip. Absence of lithic artifacts. In the sector with the "flute mouthpiece", attenuated in contact with the Argille Azzurre, the pebbles are arranged in the same sense in which the discontinuity emerges.
121	Artificial level about 10 cm thick without evidence of preferential planes. Yellowish brown colour (10YR6/6). Same characteristics as those described for level 120. Absence of lithic artifacts.
122	Distinguished by the presence of chaotic pebbles in a clayey silty matrix. Level about 15 cm thick without evidence of preferential planes. Yellowish brown colour (10YR6/6). Presence of Fe-Mn patina on the gravel. Absence of lithic artifacts. Represents the level directly disturbed by the slip, in which in the past the more or less channelled movement of the underground water was concentrated. In correspondence with the "flute mouthpiece" the pebbles are arranged parallel to the discontinuity. *[Interpretation: In levels 119-122 the original situation of the sediment is no longer interpretable since it was disturbed by the landslide and by the circulation of underground water.]*
Below	Degraded and carbonated Argille Azzurre

The sedimentary facies revealed in the excavation section fits well with the model of rivers with braided channels. This is a depositional environment characterised by quite variable sedimentation and flow rates and is characterised by multiple channels which frequently change position, in which "relatively steep slopes and high flow rates permit the transport of large quantities of coarse material, especially sandy-gravels. From the proximal tract (closest to the sources) to the distal tract of the braided system, the dimensions of the clasts diminish while the grading increases" (Ricci Lucchi, 1980). Braided rivers, with a torrential regime, still flow from the Apennines down to the coast, in other words in similar situations to the Pleistocene at Monte Poggiolo.

The flooding of water courses of this kind gives rise to complex bodies which are generally elongated, and which can become tubular if the river and the connected bar system undergoes significant lateral migrations. The facies which one comes across essentially correspond, as is clear in figure 2, to bar deposits (2) and, to a lesser extent, to channel bottoms (1) or abandoned channels (3).

In this particular case one especially finds longitudinal bar facies which are connected to the accumulations which develop in fluvial environments between the flow of the current. These bars grow forwards and upwards "starting from a coarse core abandoned by the current not so much because of the loss of the overall carrying capacity (e.g. declining phase of the high water periods) but because of the local lack of competence (capacity to transport the coarser granules). The bar migrates in the channel in front (given the convergence of the two channels next to the bar) during the periods of high water; its summit may be submerged by thin water (secondary currents) which excavate channels in oblique or transversal directions. During the periods of low water the bar emerges and may be cut on the sides. The highest bars which are built by the greatest periods of high water (in plurannual periods) remain in the form of islands during the normal periods of high water and are covered with vegetation" (Ricci Lucchi, 1980).

In the uppermost gravely part of the sediment examined here, below the surface carbonated levels modified by pedogenesis, situations dominate which can be attributed above all to the central sector of the longitudinal bars, characterised above all by the absence of stratification or coarse parallel lamination (facies 2). In the series there are various truncated sequences with a decreasing granulometry and energy with erosion surfaces at the base (EB) corresponding to the channel bottom of the high water, with a pebble pavement. The situation is complicated by the effect of partial erosion, in conditions of low water and emergence, followed by new marginal sedimentation, as well as by the effects of the migration of the bar. In this sector of the sequence the presence of configurations with parallel or low angle laminations and pockets of silty sand with concave laminations is rare, while these characterise the upper part of the bar or the abandoned channels (facies 3).

In the lower part of the deposit, which is the most sandy and distal part of the system, the frontal bar facies become markedly predominant, and are characterised by a reduction in the clasts and a greater grading. The sedimentation is more complex, articulated and lenticular with juxtapositions of more sandy lenses and levels enriched with gravely elements. In this case too one finds truncated cycles of decreasing energy with their relative pebble pavements. There is a frequent repetition of sequences with a decreasing deposition energy towards the top and therefore a tendency towards decreasing granulometry. More common than in the upper part of the deposit are the configurations attributable to summit bar facies or channel bottoms with concave crossed stratification. In this section too there is a complexity which is probably due both to phenomena of marginal erosion of the bars and to the subsequent renewal in sedimentation, and also to the evolution of the deposit itself. Rare, but not infrequent, are the traces of pelitic deposition which can be attributed to facies of abandoned channels of which the only evidence is represented by silty and sometimes clayey eroded or reduced lenses with smaller sized inclusions.

3. SECTOR WITH THE PALAEOSOIL

The stratigraphic excavation, which was carried out in this area by means of the excavation of a series of levels about 10 cm thick which were adapted however to the situation of the deposit in order to be able to highlight the main stratigraphic situations present, made it possible to distinguish the following:

1. the actual cultivated Ap soil, which reworked a surface sector of the B horizon of the palaeosoil and the lithic industry present in it, previously decapitated by erosive processes in the upper part;
2. the B2 and B3 horizons of the Palexeralf (Antoniazzi *et al.* 1992b) which contain Palaeolithic artifacts as a residue of the alteration of the bedrock in which the pedogenesis determined important modifications in the composition and dimensions of the gravel (notably enriched in flint, due to the destruction and profound alteration of the sandstone and limestone pebbles);
3. the C horizon of the palaeosoil in which the effects of the pedogenesis of the bedrock become more and more significant with the increase in depth.

In particular the stratigraphic sequence examined has the following characteristics:

As far as level 68 the excavation was mainly concerned with the B2 horizon of the palaeosoil, distinguished by a particular enrichment of illuvial clay and towards the base of carbonates, and then the B3 horizon with transitional characteristics towards the C horizons, represented by the bedrock which was relatively little influenced by the pedogenesis.

In the following levels there are sedimentary situations with braided facies analogous to those described in the case of the original deposit and practically unaltered, present in the eastern sector of the excavation.

Above	Silty clayey agricultural soil with gravel. Ap ranging from reddish brown (2.5YR4/4) to dark brown (7.5 YR4/6) and with abundant lithic industry
50-51	Sandy clayey soil with mainly siliceous gravel of minute dimensions. Dark brown colour (7.5YR4/6) with red tones when damp. Presence of very decalcified limestone and sandstone pedorelicts. The pebbles and lithic artifacts show a chaotic distribution, although there is no pseudo retouch on the artifacts or traces of weathering. To the east the deposit terminates in correspondence with the discontinuity, along which the palaeosoil lies next to the original sandy gravely deposit excavated further uphill.
52	General characteristics of the soil as in the previous levels. With respect to these however the level is less chaotic and richer in gravel. The coarsest gravels tend to be differentiated from the fine earth and the small gravel, concentrated in irregular levels with a slope of about 16 degrees. The levels, which tend to follow the orientation of the deposit, emerge towards the west with a slope of 22-25 degrees. To the east there is a certain enrichment in carbonatic concentrations in correspondence with the margin of the discontinuity, which then tends to continue towards the bottom.
53	Overall similar aspect to that of the previous level. Yellowish brown colour (10YR5/4). The coarsest pebbles tend to be concentrated in quite irregular zones. Distribution of the pebbles and lithic artifacts without preferential orientation. The latter are generally lacking pseudo retouch and traces of weathering.
54	Analogous situation to the previous level. Towards the bottom there is a certain enrichment in the clay. The base is undulating which thickens the level.
55	The deposit is constituted by clayey fine sand with abundant pulverulent concretions of carbonates. Light yellowish brown colour (10YR6/4). The scarce gravel, which is sometimes coarse, tends to be concentrated in the central part of the excavation, with a lenticular orientation, and disappears towards the west. The pebbles and the lithic artifacts are very encrusted with carbonates. To the east the discontinuity with respect to the original sandy gravely deposit excavated further uphill starts to become verticalised.
56	Analogous situation to that of the previous level. To the east the soil is sandier along the margin of the discontinuity.
57	Like the previous level. The pedorelicts are more frequent. To the east the gravel tends to increase towards the discontinuity.
58-59	Situation analogous to that in the previous levels, but with coarser gravel. Yellowish brown colour (10YR5/4). Pebbles with quite marked decalcification are common. Thin carbonatic concretions elongated vertically (fissure or root cavity fill).
60	Like the previous level, but with concentrations of coarse gravel in the western sector. On some of the lithic artifacts there are traces of weathering.
61	Sandy clayey soil with a yellowish brown colour (10YR5/4) with few inclined coarse pebbles. The vertical discontinuity between the palaeosoil and the original sandy gravely deposit further uphill is open (8-10 cm wide) and is filled with slightly clayey sand. Towards the soil the margin of the fissure is less clear than towards the original unpedogenised deposit further uphill.
62-66	Yellowish brown coloured clayey soil (10YR5/4) with concentrations of stones. The pebbles are arranged according to planes inclined towards the west with a quite regular orientation corresponding to the general orientation of the sediment. The discontinuity towards the east becomes subvertical and the white carbonatic deposit forms a step. The slope towards the west of the deposit tends to decrease until it is subhorizontal.

67	Reddish brown silty sandy soil (5YR5/4) with few stones. It rests on a whitish level rich in calcium carbonates with small and medium sized pebbles. The slope of the deposit (about 10 degrees) is clearly emerging towards the south-east.
68	Silty sandy soil with an abundant gravel fraction and with large isolated pebbles. Reddish brown colour (5YR5/4) with wide whitish patches due to the high degree of carbonation of the mass. The pebbles are normally coated with carbonate concretions. The contact to the east with the discontinuity is clear and there are verticalised pebbles. In the fissure there are traces of reddish brown sandy soil with granules of clay.
69-71	Light olive brown silty sandy sediment (2.5Y5/6) with a marked white carbonisation at the top (circa 10 cm). Medium and small sized pebbles sparse in the mass. Few lithic artifacts. The identical colour of the sediments to the east and to the west of the discontinuity makes the transition between the two deposits less evident. On the margin there are still however verticalised pebbles. The transition between the last level and the next one (73) is clear, and it lies immediately above a concentration of pebbles which form a level which was followed without difficulty during the excavation. The situation might be compared with the transition between levels 102c and 103a in the sector of the excavation which lies further to the east, concerning the original sandy gravely deposit.
73-75	Below the level of the pebbles described, there are abundant small and medium sized pebbles in the sandy silty soil. The deposit is homogeneous and its immersion towards the east, which is also highlighted by the arrangement of the flattened pebbles, tends to be accentuated towards the bottom. Only at the base is there a decidedly sandier level. Various flint flakes, deliberately detached from the same pebble and some of which refit, were found in level 74. Some of these, which appertain to the same pebble, were also found in level 75.
76-79	The deposit differs clearly from that above due to the almost total disappearance of the small pebbles and because of the sandy matrix. Yellowish brown colour (10YR6/6). It is constituted by loose silty sand with scarce pebbles of large dimensions (decimetric). There are vertical fissures filled with carbonates. The immersion of the sediment is about 20 degrees towards the east with an accentuation close to the discontinuity. In level 78 there is a flaked pebble.

BIBLIOGRAPHY

AMORE O., ANTONIAZZI A., ANTONIAZZI AL., CATTANI C., ESPOSITO P., GAGNEPAIN J., LONGO L., MONEGATTI P., PERETTO C., PUGLIESE N., UNGARO S. (1996): Il sito di Ca' Belvedere di Monte Poggiolo, Catalogo della mostra "Quando Forlì non c'era" a cura di Bermond Montanari G, Massi Pasi M., Prati L., A.B.A.C.O., Forlì, pp. 59-70.

ANTONIAZZI A. (1978): I suoli della Provincia di Forlì e i fattori naturali limitanti la loro utilizzazione, publ. n. 41 del Centro di Studio della Genesi, Classificazione e Cartografia del Suolo del C.N.R., Forlì, 134 pp.

ANTONIAZZI A., BISI F., GREGGI S., MAZZAVILLANI P. (1992): Le ghiaie del sedimento con l'industria paleolitica e quelle di altri depositi locali, *in:* I primi abitanti della Valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, a cura di Peretto C., Jaka Book, Milano, pp. 275-289.

ANTONIAZZI A., CREMASCHI M. (1987): I paleosuoli, *in:* Alle origini della Romagna: 2. I primi abitanti, a cura di Peretto C., Prati L., Catalogo della mostra, Grafiche M.D.M., Forlì, pp. 43-45.

ANTONIAZZI A., CREMASCHI M., GAGNEPAIN J., PERETTO C. (1992): Indagini preliminari sulla stratigrafia del giacimento di Ca' Belvedere di Monte Poggiolo: aspetti sedimentologici e pedologici, *in:* I primi abitanti della Valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, a cura di Peretto C., Jaka Book, Milano, pp. 255-273.

ANTONIAZZI A., PIANI G. (1992): Il sito di Monte Poggiolo nell'ambito delle conoscenze geologiche regionali, *in:* I primi abitanti della Valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, a cura di Peretto C., Jaka Book, Milano, pp. 237-254.

ANTONIAZZI Al. (1996): "Lineamenti geologici dell'area pedecollinare forlivese". Tesi di Laurea inedita, Dipartimento di Scienze Geologiche e Paleontologiche Università degli studi di Ferrara, pp. 167.

BOSELLINI A., MUTTI E., RICCI LUCCHI F. (1989), Rocce e successioni sedimentarie, U.T.E.T., Torino, pp. 1-395.

CATTANI L. (1992): Il ricoprimento vegetale dell'area padana durante il Pleistocene inferiore e medio, *in:* I primi abitanti della valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, a cura di C. Peretto, Jaca Book, Milano, pp. 291-302.

MASSARI F., PAREA G. C. (1988): Progradational gravel beach sequences in a moderate- to high-energy, microtidal marine environment, *Sedimentology*, 35, pp. 881-913.

PAREA G. C. (1986): *I* terrazzi marini tardo-pleistocenici del fronte della catena appenninica in relazione alla geologia dell'avanfossa adriatica, Memorie della Società Geologica Italiana, 35, pp. 913-936.

PERETTO C. (1992a): I primi abitanti della Valle Padana. Cronologia e tipologia delle industrie del Paleolitico inferiore, *in:* I primi abitanti della valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, Jaca Book, Milano, pp. 229-236.

PERETTO C. a cura di, (1992b): I primi abitanti della Valle Padana: Monte Poggiolo nel quadro delle conoscenze europee, Jaca Book, Milano, pp. 1-365.

RICCI LUCCHI F. (1978-1980): Sedimentologia, tre volumi, CLUEB, Bologna.

RICCI LUCCHI F.,. COLALONGO M. L, CREMONINI G., GASPERI G.. IACCARINO S., PAPANI G., RAFFI S., RIO D. (1982): Evoluzione sedimentaria e paleogeografica nel margine appenninico, *in:* Guida alla geologia del margine appenninico, Soc. Geol. It., I, Bologna, pp. 17-46.

VEGGIANI A. (1965): Trasporto di materiale ghiaioso per correnti di riva dall'area marchigiana all'area emiliana durante il Quaternario, *Boll. Soc. Geol. It.*, 34 (2), pp. 315-328.

ZANGHERI P. (1927): Il corso del Montone e del Rabbi dalle epoche geologiche ai tempi attuali, *in:* Forum Livii, Forlì, 1 pp. 29-35, 2 pp. 26-33 e 5 pp. 51-64.

ZANGHERI P. (1956): I depositi alluvionali pleistocenici della pianura romagnola attorno a Forlì e la loro posizione nella cronologia del Quaternario, *Studi romagnoli*, 7, Imola, pp. 479-491.

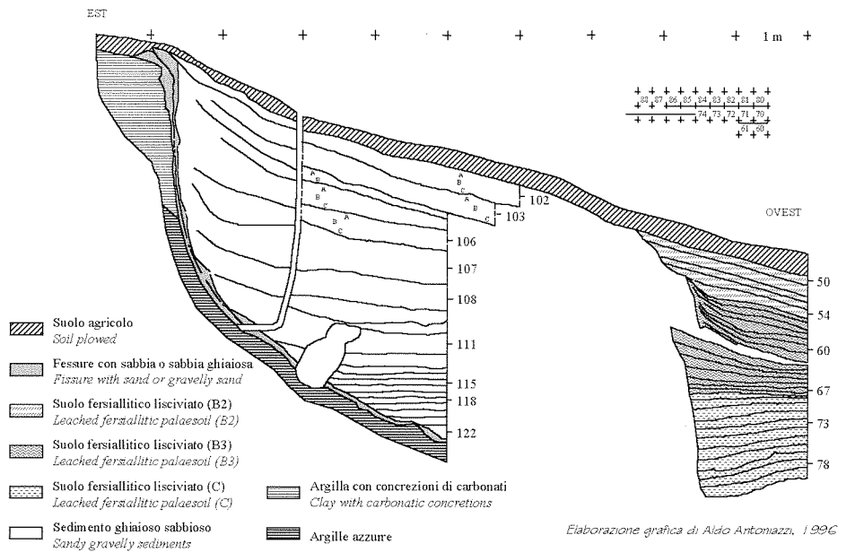
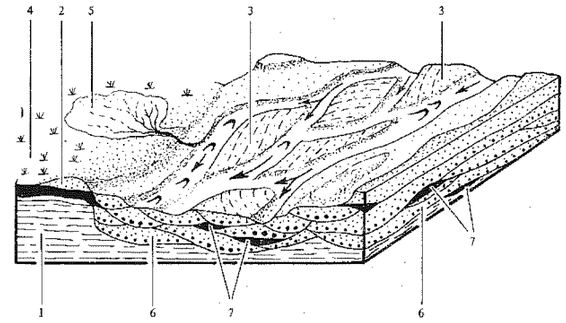
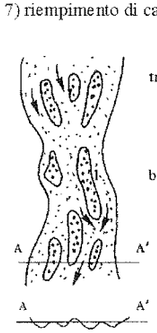


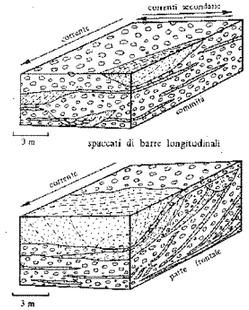
Fig. 1. Stratigraphic section of the excavation at Ca' Belvedere di Monte Poggiolo.



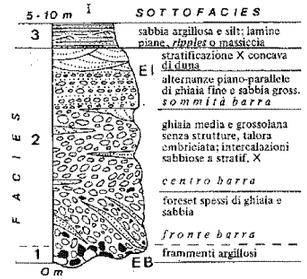
Alveo a canali intrecciati. 1) alluvium più antico, 2) argine naturale, 3) barra, 4) piana inondabile, 5) lingua o ventaglio di rotta, 6) fondo canale, 7) riempimento di canali morti.



Planimetria di corso intrecciato



Stratificazione di barra *braid*



Barra longitudinale, zona prossimale

EI= Superficie di erosione interna (fondo canale di magra)
EB= Supeficie di erosione di base ciclo (fondo canale di piena)

FACIES:
1) fondo canale
2) barra
3) canale abbandonato

Fig. 2. Model of braided channels - from Ricci Lucci 1980.